

Quarterly Status, Management, and Cost Report #7

Contract Name: Seismic Calibration for IMS Stations in North Africa and Western Asia (Group 2)

Contractor: Science Applications International Corporation

Contract Number: DTRA01-00-C-0013

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Period of Performance: March 1, 2000 – February 28, 2003

Reporting Period: September 15, 2001 – December 7, 2001

Background

The Group 2 Consortium is composed of SAIC as the prime contractor with Harvard University, University of Colorado at Boulder (CUB), University of California San Diego (UCSD), Geophysical Institute of Israel (GII), Multimax, and Western Services as subcontractors.

Travel-time corrections will be developed, tested, and validated in two phases over a period of three years. The team will construct location corrections, as recommended by CTBT/WGB/TL-2/18, using three methodologies: 1) Tectonic regionalization will be used to assign 1D velocity models to each tectonic province and SSSCs computed by 2D and 3D ray-tracing. 2) 3D hybrid models consisting of global and regional models will be constructed and ray-tracing will be performed. 3D hybrid models will make use of the best available models for each region. Team members as part of related work may perform revision of 3D models using available data in selected regions. 3) Event clusters will be selected and Joint Hypocenter Determination (JHD) will be used to define empirical travel time corrections for small selected regions. Inter-comparison of methodologies will contribute to a priori modeling error estimates. Offline unit testing and validation of model-based SSSCs will be performed using existing and expanded Ground Truth (GT).

Progress in Current Reporting Period (September 15, 2001 – December 7, 2001)

Administrative

- The Group 2 Consortium's Phase 1 delivery was made to DTRA on October 26, 2001. It included CDRL items A003, A005, A006, A008, and A009, accompanied by a delivery letter. The delivery is posted at the Consortium's web site (<http://g2calibration.cmr.gov>). A copy of the delivery was provided to the Center for Monitoring Research.

Meetings/papers/memos

- Keith McLaughlin, Joydeep Bhattacharyya, and István Bondár (SAIC) visited Harvard on September 20, 2001 to discuss Phase 1 wrap-up and Phase 2 plans.
- Keith McLaughlin, Joydeep Bhattacharyya, István Bondár, Xiaoping Yang (SAIC), Indra Gupta, and Bob Wagner (Multimax) met at CMR on September 24, 2001. The meeting minutes are posted at the Consortium's web site (<http://g2calibration.cmr.gov>).
- Victor Kirichenko and Yury Kraev (Western Services) completed a final report, "Selection of Candidate Reference Events in the Northern Caucasus Region" in September 2001. The report is posted at the Consortium's web site (http://g2calibration.cmr.gov/calibration/PDF/Caucasus_final.pdf).
- Keith McLaughlin, Joydeep Bhattacharyya, István Bondár, Xiaoping Yang (SAIC), Michael Ritzwoller, Masha Barmin, Nikolai Shapiro, Bob Engdahl, Eric Bergman (CUB), Romi Hofstetter (GII), Winston Chan, and Hafidh Ghalib (Multimax) attended the 23rd Seismic Research Review at Jackson Hole, Wyoming, October 1-5, 2001. A consortium meeting was held on October 3, 2001. The meeting minutes are posted at the Consortium's web site (<http://g2calibration.cmr.gov>).
- Keith McLaughlin, Joydeep Bhattacharyya, István Bondár, and Xiaoping Yang (SAIC) met with Dr. Sahil Alsinawi (ITT) at SAIC on October 31, 2000 to discuss obtaining information from North Africa & Middle East.

Phase 1 CCB proposal

Drafting a CCB memo for the CMR Configuration Control Board was a major focus of the reporting period. The draft proposal and supporting documentation may be found at <http://g2calibration.cmr.gov/calibration/result.html>. The CCB proposal will be submitted to the CCB December 20th 2001.

Data development

Reference events (GT0-5) and seismic event bulletins continue to be collected in the Consortium's region of interest (15S-80N, 40W-100E):

- Victor Kirichenko and Yury Kraev (Western Services) completed the Northern Caucasus project. The final report identifies several GT5 reference events and candidates as well as local velocity models and travel-time curves for the region.

- Hafidh Ghalib (Multimax) acquired local bulletins from Kuwait, Iraq and Saudi Arabia, Multimax is searching them for reference event candidates and arrival data for existing reference events.
- Multimax compiled event cluster data for Djibouti.
- Rami Hoftstetter (GII) acquired arrival data for existing reference events from Ethiopia.
- Walter Mooney (USGS) provided the ground truth shot locations of the Saudi refraction profile carried out in 1978. No arrivals are available for these GT shots conducted in the Red Sea.
- Nobuo Hurukawa (Japan) and Imam Marzouk (Egypt) provided a event list located by the Hurghada network (Egypt) between 1994 and 1998. Some of these events may qualify as GT5.
- Joerg Ansorge (ETH) provided documentation on controlled explosions carried out during the European Geotraverse between 1983 and 1986. Arrivals were extracted from the ISC bulletin for two shots in Germany and two shots in the Ligurian Sea. These GT0 events were added to the Reference Event List.
- Shelly Johnson (Weston Geophysical) provided the “Valentines Day” event in Pakistan (near Nilore). The event was added to the Reference Event List as GT5.
- University of Colorado provided updated event cluster data for 13 clusters.
- University of Colorado provided Phase 1 Grid Search relocation results.
- Multimax relocated PNEs using former Soviet Union station phase arrivals provided by Harvard combined with existing bulletins, with and without the Phase 1 SSSCs.

Model/SSSC development:

During this reporting period the consortium shifted its focus to Phase 2 model and SSSC development. During Phase 2, CUB will provide a revised 3D crust & upper mantle model, CUB will continue to collect reference event data and validate GTX events with HDC cluster analysis, Harvard & SAIC will pursue the use of teleseismic P-wave SSSCs in the Group 2 region, Multimax will continue to collect and analyze reference events, GII will continue to collect reference event data and investigate regional Pg and Lg in the middle east, UCSD will perform model validation studies, Western Services will collect reference event data in central Asia, SAIC will continue to coordinate activities, maintain the reference event database, investigate model errors, and integration results. Some highlights the reporting period are listed below.

- CUB delivered a Phase 2 plan, including finalizing the raytracer as well as group velocity and validating data sets, and constructing new reference models.
- The SAIC crustal model was updated in Central Asia using Victor Kirichenko's proposed models.
- Mike Antolik (Harvard) provided several group and phase velocity maps for the joint SAIC-HRV models at a suite of periods. They were delivered to Gabi Laske (UCSD) for validation testing of the SAIC-HRV model with these maps.

- UCB provided HDC Pn, Pg, and P path corrections files for 13 event clusters. They are based on residuals already corrected for ellipticity and station elevation. These data were loaded into the database.
- Harvard provided the travel time computation tool for teleseismic SSSCs using S&P12/WM13 mantle model. P and S SSSCs were computed for GESTT-3 stations and about 1000 other stations with IDC and scaled IDC modeling errors between distances of 20-97 degrees. Preliminary relocation validation testing shows improved location results using these SSSCs.
- CUB provided an updated ray tracer for regional SSSC calculations. It computes Pn, Sn, Pg, and Lg SSSCs within 20 degrees of the station using the CUB model.
- Istituto Nazionale di Geofisica e Vulcanologia (INGV) provided a 3D velocity model of the Mediterranean region. This model will be compared to the CUB model for cross-validation and may be considered for possible relocation experiments.

Plans for Next Reporting Period (December 8, 2001 – March 1, 2002)

Administrative

- A CCB proposal based on the Group 2 Phase 1 delivery will be presented December 20th 2001 to the CMR Configuration Control Board.

Meetings/papers

- Several consortium members will attend the AGU meeting in San Francisco in December 10-14, 2001.
- Abstracts to the SSA and Oslo workshop will be drafted.
- Dr. K. McLaughlin will attend a two-day RAS/BGA Geophysical Discussion meeting at The Geological Society, Burlington House, Piccadilly, London, 7-8 February 2002, to show how scientific challenges generated by the Comprehensive Nuclear Test-Ban Treaty (CTBT) continue to stimulate advances in Earth science, including improved knowledge of the lithospheric structure of the British Isles.

Data development

- Collection/validation of reference events, event clusters and local and regional velocity models will continue.

Model development

- The parameterization of the Harvard-SAIC model will be modified to comply with Harvard's representation of the mantle.
- CUB will continue relocation study using model CUB1.0 applied to an expanding set of GT events supplied by Bob Engdahl.
- CUB will continue to improve the CUB model by introducing Fresnel zone tomography and CRUST2.0 as the basis model.
- Testing of teleseismic P-wave SSSCs for the Group 2 region will be tested.

- Testing of the INGV 3D velocity model will begin.

Cost Report

See attachments.